Intermountain Region BHS/Domestic Sheep-Risk Assessment for Region 4 National Forests

Wyoming Herds (Bridger-Teton and Caribou-Targhee Forests)

Results of Analysis

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Background

Because population viability analyses for Intermountain Region forests under the 2012 planning rule may not be completed for several years, an Intermountain Region Bighorn Sheep/Domestic Sheep Framework was developed to assist the Region's forests in assessing risks to bighorn sheep populations (*Ovis canadensis*, BHS). The framework employs a Risk of Contact (ROC) model that estimates the potential of BHS to foray from a Core Herd Home Range (CHHR) onto nearby domestic sheep allotments. The ROC model was initially developed for use in the Payette National Forest's *Forest Plan Amendment Identifying Suitable Rangeland for Domestic Sheep and Goat Grazing to Maintain Habitat for Viable Bighorn Sheep Populations* (2010). When used in the context of other factors such as population resilience and distribution, the model can assist in evaluations of risks to BHS populations for a planning unit. This document provides a brief description of BHS risk considerations including ROC model output and descriptions of Core Herd Home Ranges (CHHR) (Figure 1) on the Bridger-Teton (BTNF) and Caribou-Targhee (CTNF) National Forests in Wyoming.

Data Sources and Analyses

Available telemetry and observation data were used to create Core Herd Home Ranges (CHHRs) for BHS on Intermountain Region Forest lands. Wyoming Game and Fish Department (WGFD) biologists were involved in the identification and review of BHS CHHRs and the review of source habitat data as part of an expert review process. Multiple CHHR configurations were evaluated and final CHHR configurations were chosen with biological input from WGFD. Population and demographic information were provided by WGFD (Table 1).

Forest Responsibility Regarding ROC Analysis

Forests within the Intermountain Region that have populations of BHS carefully consider a variety of qualitative and quantitative factors to evaluate risk to BHS population persistence on their lands. Initial factors considered include resiliency of a herd (> large populations have greater resiliency to extirpation from disease), continued BHS persistence even with continued disease exposure, and redundancy of herds on the planning unit.

Changes in grazing management are usually unnecessary where there is a low ROC. The modeled ROC output is a useful starting point for analysis, and is insufficient as a stand-alone metric. Limitations to the model (e.g., availability of data, model precision, and other factors such as topographical barriers that are not modeled) are also considered. The model output estimates a spatial risk of contact between BHS and an allotment area, but it does not incorporate other probabilities such as animal to animal contact, disease transmission, and the total risk of a disease event and BHS population loss. The analysis assumes a ROC level between a CHRR and an allotment using a May 1 to October 31 timeframe, and thus another important factor that is considered are the actual dates that domestic sheep are on the allotment.

If a high risk is identified, mitigations may be implemented as opportunities arise, as practicable, or upon more detailed analysis (e.g., during Forest Plan revision). Mitigating responses used to lower the overall risk include altering timing and distribution of domestic sheep and other approaches identified in state management plans. Each forest obtains information from grazing allotment permittees, state fish and game agencies, tribes, and other entities as appropriate in order to develop the best collaborative response strategies.

ROC Analysis Results

Six BHS herds are associated with NFS lands have sufficient data available for home range identification (Table 1; data provided by WGF).

Table 1. Population estimates and demographical characteristics of six BHS populations associated with Core Herd Home Ranges on the Bridger-Teton National Forest in Wyoming

CHHR	Population Estimate	Adult Population	Lambs per 100 Ewes	Rams per 100 Ewes	Ram Ratio	Ewe Ratio
Absaroka[1]	4,500	3,754	23-52[1]	20-63[1]	30%	70%
Darby Mtn.	60	46	35	12	11%	89%
Jackson North	310	263	31	75	43%	57%
Jackson South	40	28	60	30	25%	75%
Targhee	125	100	33	35	26%	74%
Whiskey Mtn.[2]	950	821	22	40	29%	71%

[1] Range of lamb:ewe and ram:ewe ratios for five herds that comprise the Absaroka metapopulation

Absaroka CHHR

The Absaroka CHHR is a meta-population that includes five BHS herd units, some of which occupy lands on the Bridger-Teton National Forest. The northwestern corner of the BTNF includes habitat and BHS observations that contribute to this CHHR. The southeastern portion of the CHHR includes lands on the Wind River Indian Reservation. The five BHS herd units that contribute to the larger Absaroka Mountain Range meta-population include Clarks Fork, Trout Peak, Wapiti Ridge, Francs Peak and Yount's Peak. The southern-most portion of the CHHR overlaps with the Whiskey Mountain CHHR on the Shoshone and Bridger-Teton National Forest.

The Absaroka Range supports the largest Rocky Mountain bighorn sheep herd in the conterminous United States (4500 animals) and is considered a core native BHS population in Wyoming. Disease is not currently considered a primary threat for this population, and no recent disease outbreaks have been identified. Lamb:ewe ratios among the five herd units vary from 22-52%. Lamb recruitment rates in four of the five herd units are thought to be primarily carry-capacity related. In addition, composition counts for these populations occur in the winter where there is likely mixing of the various herds. Although lamb recruitment rates may be low, they are considered acceptable for a large, stable population.

The analysis indicated there are no domestic sheep allotments on Intermountain Region NFS lands potentially affecting the CHHR. The national forest lands associated with this CHHR are essential in providing habitats that support a viable BHS population on the Bridger-Teton National Forest.

Whiskey Mountain

The Whiskey Mountain herd occurs on the eastern portion of the BTNF. The Wyoming Bighorn Sheep/Domestic Sheep Interaction Working Group – Final Report and Recommendations (Wyoming Plan), identifies the Whiskey Mountain herd as a Core Native Herd and of high importance. The herd was historically larger than current counts, and served as a transplant source for reestablishing BHS populations in the western U.S. A disease outbreak in 1991 resulted in a loss of 30-40% of the population, and post-outbreak lamb recruitment rates as low as 10-17%. Lamb recruitment remains low (22 lambs:100 ewes) for this population. Disease is still a concern within the population, which remains at approximately 2/3 of the pre-outbreak level, estimated at 1500 animals.

The generated CHHR for Whiskey Mountain overlaps with the Absaroka CHHR. A highway is thought to be a potential barrier between the populations, as there is no documentation that supports interchange between these two populations based on telemetry data. These herds may overlap on the winter ranges, off NFS lands. Further monitoring would provide clarification on movements between these populations. Table 2 displays the modeled BHS herd-domestic sheep allotment risk of contact by foraying BHS.

Table 2. Whiskey Mountain CHHR - Evaluation of risk of contact between foraying BHS and domestic sheep allotments.

Allotments	Modeled Risk of Contact	Preliminary Identified Mitigations and Circumstances[1]
BALDY LAKE	2.035	Closed
NORTH FORK	1.337	Closed
PIPESTONE	0.792	Closed
ROCK CREEK	0.360	Multi-BHS herd interaction; problematic for domestic sheep grazing due to comingling with BHS after predator scatter
MIDDLE FORK	0.320	Closed
LIME CREEK	0.284	Multi-herd interaction; problematic for domestic sheep grazing due to comingling from predator scatter
TOSI CREEK	0.147	Multi-herd interaction; problematic for domestic sheep grazing due to comingling from predator scatter
RAID LAKE	0.110	Vacant
ELK RIDGE	0.103	Multi-herd interaction; problematic for domestic sheep grazing due to comingling from predator scatter
CROSS LAKE	0.021	Vacant
EAST FORK	0.001	Vacant

[1] Listed are initially identified contextual factors that may influence allotment-specific risk tolerance. We will continue to work cooperatively with permittees, the State of Wyoming and other interests to identify additional potential mitigations or circumstances before administrative changes are proposed

Jackson North and Jackson South

The Jackson population is found to the east and southeast of Jackson, Wyoming. The BTNF contributes to the majority of habitat used by this population. The Wyoming Plan identifies the Jackson herd as a Core Native Herd. It is one of the core native populations and of high importance.

Recent disease outbreaks from 2010-2012 reduced the population by approximately 30%. The pre-outbreak population was estimated at 450 animals, and lamb recruitment was suppressed for a few years following the outbreak. The herd appears to be recovering towards pre-outbreak levels.

WGFD managers recommended dividing the Jackson Herd into two distinct populations for this analysis. Although suitable habitat exists between the two populations, there is little or no evidence of interchange between the two groups. The northern population is migratory and represents approximately 360 sheep. The southern population is non-migratory and represents only 40 sheep, and thus may be more susceptible to impacts of a disease outbreak than larger populations. The majority of these sheep originated from a transplant in 1980. Of the 36 ewes that have been GPS-collared in this herd (including 18 collars that are still on sheep), none have moved between the two groups. Also, no sheep have been observed between the two groups during summer bear flights or from outfitter contacts. Table 3 and Table 4 present the risk of contact to nearby allotments. We recognize that there is a level of uncertainty regarding these herds and will adjust in the future as new information emerges.

Table 3. Jackson North CHHR - Evaluation of risk of contact between foraying BHS and domestic sheep allotments. *Allotments are administered by the Caribou-Targhee National Forest

Allotment	Modeled Risk of Contact	Preliminary Identified Mitigations and Circumstances
TOSI CREEK	Overlap	Multi-herd interaction; problematic for domestic sheep grazing due to comingling from predator scatter
LIME CREEK	0.413	Multi-herd interaction; problematic for domestic sheep grazing due to comingling from predator scatter
DOG CREEK*	0.355	Topographic/geological barriers, human development barriers, 3 month and 5 day grazing season
PALISADES*	0.250	Topographic/geological barriers, human development barriers, less than 3 month grazing season
PHILLIPS CANYON S&G	0.203	Closed
GRAND BLOWOUT*	0.202	Topographic/geological, human development barriers, less than 3 month grazing season Divided allotment; rested intermittently
ROCK CREEK	0.198	multi-herd interaction; problematic for domestic sheep grazing due to predator scatter
BAILEY LAKE	0.185	Short grazing season, rested

		intermittently; divided allotment
SOUTH ELK*	0.184	Topographic/geological barriers, human development barriers, less than 3 month grazing season
AUSTIN CANYON*	0.163	Topographic/geological barriers, human development barriers, less than 3 month grazing season
UPPER GRAYBACK-PHOSPHATE BIGHORN	0.145	Closed
ELK RIDGE	0.130	multi-herd interaction; problematic for domestic sheep grazing due to predator scatter
SOUTH INDIAN-COTTONWOOD*	0.090	Topographic/geological barriers, human development barriers, less than 3 month grazing season
BURBANK*	0.070	Topographic/geological barriers, human development barriers, less than 3 month grazing season
ELK MOUNTAIN	0.049	Short grazing season, rested intermittently
PICKLE PASS BIGHORN SHEEP	0.047	Closed
SNAKE RIVER	0.031	Short grazing season, rested intermittently
NORTH MIDDLE RIDGE	0.022	Short grazing season, rested intermittently; Topographical barriers
GRIZZLY CREEK BIGHORN SHEEP	0.014	Closed
BLIND TRAIL	0.007	Short grazing season, rested intermittently
SQUAW CR-WEINER CR (FORAGE RESERVE)	0.006	Forage reserve
STEWART	0.005	Short grazing season, rested intermittently; topographic barrier
CORRAL CREEK BIGHORN SHEEP	0.004	Closed
GRAND VALLEY*	Negligible Risk	Negligible Risk
GREEN*	Negligible Risk	Negligible Risk
MULE CREEK S&G (FORAGE RESERVE)	Negligible Risk	Negligible Risk
RUSSELL-VAN*	Negligible Risk	Negligible Risk
ELK FLAT*	Negligible Risk	Negligible Risk

Table 4. Jackson South CHHR - Evaluation of risk of contact between foraying BHS and domestic sheep allotments. *Allotments are administered by the Caribou-Targhee National Forest

Allotment	Modeled Risk of Contact	Preliminary Identified Mitigations and Circumstances
UPPER GRAYBACK-PHOSPHATE BIGHORN	Overlap	Closed
BAILEY LAKE	0.127	Short grazing season, rested intermittently
PICKLE PASS BIGHORN SHEEP	0.098	Closed
GRIZZLY CREEK BIGHORN SHEEP	0.045	Closed
DOG CREEK*	0.037	Topographic/geological barriers, human development barriers, less than 3 month 5 day grazing season
GRAND BLOWOUT*	0.029	Topographic/geological barriers, human development barriers, less than 3 month grazing season, divided allotment, rested intermittently
ELK MOUNTAIN	0.028	Short grazing season, rested intermittently; topographic barrier
BLIND TRAIL	0.026	Short grazing season, rested intermittently; topographic barrier
SOUTH ELK*	0.026	Topographic/geological barriers, human development barriers, less than 3 month grazing season
NORTH MIDDLE RIDGE	0.025	Short grazing season; rested intermittently
STEWART	0.023	Short grazing season;
MULE CREEK S&G (FORAGE RESERVE)	0.016	Forage reserve
GRIZZLY BASIN	0.015	Short grazing season, rested intermittently
CORRAL CREEK BIGHORN SHEEP	0.014	Closed
SNAKE RIVER	0.012	Short grazing season, rested intermittently
BIRCH CREEK-STAR PEAKS (FORAGE RES)	0.011	Forage reserve
DEADMAN	0.011	Short grazing season, rested intermittently
PROSPECT PEAK S&G (FORAGE RESERVE)	0.010	Forage reserve
SOUTH INDIAN-COTTONWOOD*	0.009	Topographic/geological barriers, human

		development barriers, less than 3 month grazing season
BLIND BULL	0.008	Short grazing season, rested intermittently
VIRGINIA PEAK	0.008	Short grazing season, rested intermittently
BLACK CANYON	0.008	Short grazing season, rested intermittently
TOSI CREEK	0.008	See Jackson North herd
SQUAW CR-WEINER CR (FORAGE RESERVE)	0.007	Forage reserve
NORTH HORSE CREEK S&G (FORAGE RES)	0.006	Forage reserve
AUSTIN CANYON*	0.004	Topographic/geological barriers, human development barriers, less than 3 month grazing season
WHITE CR-MAN PEAK (FORAGE RESERVE)	0.004	Forage reserve
PALISADES	0.004	Topographic/geological barriers, human development barriers, less than 3 month grazing season
CABIN CREEK	0.002	Short grazing season, rested intermittently
PHILLIPS CANYON S&G	0.002	Closed
BEAR CREEK	0.002	Short grazing season, rested intermittently
SOUTH FORK SHEEP CREEK (FORAGE RES)*	Negligible Risk	Negligible Risk
LIME CREEK	Negligible Risk	Negligible Risk
MARTEN CREEK (FORAGE RESERVE)	Negligible Risk	Negligible Risk
BURBANK	Negligible Risk	Negligible Risk
ELK RIDGE	Negligible Risk	Negligible Risk
ROCK CREEK	Negligible Risk	Negligible Risk
THREE FORKS	Negligible Risk	Negligible Risk
WILLIAMS CREEK	Negligible Risk	Negligible Risk
GRAND VALLEY	Negligible Risk	Negligible Risk
TROUT CREEK	Negligible Risk	Negligible Risk
TRIPLE PEAK S&G (FORAGE RESERVE)	Negligible Risk	Negligible Risk

Targhee

The Targhee population is located on the west side of the BTNF along the Idaho-Wyoming border. The Wyoming Plan, identifies the Targhee herd as a Core Native Herd. It is one of the core native populations and of high importance. Grand Teton National Park contributes the majority of habitat in the generated CHHR, however the BTNF and Caribou-Targhee National Forest (CTNF) also contribute habitat, as well as a substantial portion of the foray habitat.

Disease involvement of this herd is considered low, and there have been no recent disease epizootics. Highway 22 may provide a barrier between the CHHR and domestic sheep allotments. Table 4 displays the modeled BHS herd-domestic sheep allotment risk of contact.

Table 4. Targhee CHHR - Evaluation of risk of contact between foraying BHS and domestic sheep allotments. *Allotments are administered by the Caribou-Targhee National Forest

Allotment	Modeled Risk of Contact	Preliminary Identified Mitigations and Circumstances
PHILLIPS CANYON S&G	Overlap	Closed
BURBANK*	0.317	Short grazing season
PALISADES*	0.258	Short grazing season, limit use north of WY highway 22 to allow trailing access to and from private land shipping corral in Moose Creek.
AUSTIN CANYON*	0.162	Short grazing season
SOUTH ELK*	0.084	Short grazing season
GREEN*	0.064	Not a Forest Service allotment
ELK FLAT*	0.023	Short grazing season
PINEY PEAK*	0.019	Short grazing season
DOG CREEK*	0.016	Short grazing season
GRAND BLOWOUT*	0.012	Short grazing season
SOUTH INDIAN-COTTONWOOD *	0.005	Short grazing season
RUSSELL-VAN*	0.002	Topographical/Geographical barriers, short grazing season
CAMP CREEK-WHITE SPRINGS*	Negligible Risk	Vacant
HOME RIDGE-RED PEAK*	Negligible Risk	Negligible Risk
POKER PEAK*	Negligible Risk	Negligible Risk
GRAND VALLEY*	Negligible Risk	Negligible Risk

Darby Mountain

The Darby population is located on the southwestern portion of the BTNF in the Wyoming Range. The population is the result of a single transplant in the late 1980s. The population is not monitored regularly. No hunting permits have been authorized in this herd unit since 2011 due the lack of documentation of a sufficient number of mature rams.

Although disease involvement of the herd is suspected, there hasn't been a documented disease outbreak. The CHHR is in close proximity to domestic sheep allotments that exist in highly suitable BHS habitat to the west of the CHHR.

Given the current status and CHHR of the Darby herd, it may not be essential to meeting planning unit population requisites. The Wyoming Plan identifies the Darby herd as a 'non-emphasis' herd and the Forest Service does not have a current desire to address risks that domestic sheep may represent to this herd, however the Bridger-Teton Forest Plan indicates that if a domestic sheep allotment associated with the herd becomes vacant, grazing will not be restored. Table 5 displays the modeled BHS herd-domestic sheep allotment

Table 5. Darby CHHR - Evaluation of risk of contact between foraying BHS and domestic sheep allotments.

Allotment	Modeled Risk of Contact	Preliminary Identified Mitigations and Circumstances
BARE MOUNTAIN S&G (FORAGE RESERVE)	Overlap	Forage reserve
BLACK CANYON	Overlap	Short grazing season, rested intermittently
MARTEN CREEK (FORAGE RESERVE)	Overlap	Forage reserve
MINK CREEK	Overlap	Short grazing season, rotation among units
MT DARBY BIGHORN SHEEP	Overlap	Closed
NORTH PINEY S&G (FORAGE RESERVE)	Overlap	Forage reserve
SOUTH FORK SHEEP CREEK (FORAGE RES)	Overlap	Forage reserve
TRIPLE PEAK S&G (FORAGE RESERVE)	Overlap	Forage reserve
TWIN PEAKS BIGHORN SHEEP	Overlap	Closed
THREE FORKS	0.146	Short grazing season; rotation among units
SOUTH PINEY BIGHORN SHEEP	0.078	Closed
CORRAL CREEK	0.071	Short grazing season, rotation among units
BEAR CREEK	0.061	Short grazing season; rotation among units; rested intermittently
CABIN CREEK	0.055	Short grazing season; rested intermittently
COTTONWOOD	0.055	Short grazing season; rotation among units;

BUCKSKIN KNOLL	0.047	Short grazing season; rotation among units;
VIRGINIA PEAK	0.046	Short grazing season; rotation among units; rested intermittently
SOUTH SALT RIVER	0.043	Short grazing season; rotation among units; rested intermittently
MULE CREEK S&G (FORAGE RESERVE)	0.031	Forage reserve
LAKE MOUNTAIN	0.030	Short grazing season; rotation among units
BLIND BULL	0.028	Short grazing season; rotation among units; rested intermittently
PROSPECT PEAK S&G (FORAGE RESERVE)	0.023	Forage reserve
NORTH HORSE CREEK S&G (FORAGE RES)	0.022	Forage reserve
LAKE ALICE	0.021	Short grazing season; rotation among units
WHITE CR-MAN PEAK (FORAGE RESERVE)	0.019	Forage reserve
GRIZZLY CREEK BIGHORN SHEEP	0.017	Closed
DEADMAN	0.017	Short grazing season; rested intermittently
DEVILS HOLE	0.017	Short grazing season; rotation among units
SMITHS FORK	0.016	Short grazing season; rotation among units
BLIND TRAIL	0.016	Short grazing season; rested intermittently
BIRCH CREEK-STAR PEAKS (FORAGE RES)	0.014	Forage reserve
PICKLE PASS BIGHORN SHEEP	0.014	Closed
NORTH SALT RIVER	0.013	Short grazing season; rotation among units; rested intermittently
GRIZZLY BASIN	0.013	Short grazing season; rotation among units; rested intermittently
PORCUPINE CREEK	0.010	Short grazing season; rotation among units
CORRAL CREEK BIGHORN SHEEP	0.008	Closed
INDIAN CREEK	0.006	Short grazing season; rotation among units
STEWART	0.006	Short grazing season; rotation among units
SOUTH FONTENELLE	0.005	Short grazing season; divided allotment
UPPER GRAYBACK-PHOSPHATE BIGHORN	0.004	Closed
LITTLE WHITE CREEK	0.004	Short grazing season; rotation

		among units
SAMS ALLEN CREEK	0.003	Short grazing season; rotation among units
NORTH MIDDLE RIDGE	0.003	Short grazing season; rotation among units; rested intermittently
LOWER SALT CREEK	0.003	Short grazing season; rotation among units
BAILEY LAKE	0.002	Short grazing season; rotation among units; see Jackson herd
SQUAW CR-WEINER CR (FORAGE RESERVE)	0.002	Forage reserve
GREEN KNOLL	0.002	Short grazing season; rotation among units
ELK CREEK	0.002	Short grazing season; rotation among units
GIRAFFE CREEK	Negligible Risk	Negligible Risk
TYGEE RIDGE-1	Negligible Risk	Negligible Risk
SMITH CREEK S&G	Negligible Risk	Negligible Risk
ELK MOUNTAIN	Negligible Risk	Negligible Risk
BASIN CREEK	Negligible Risk	Negligible Risk
SPRUCE CREEK	Negligible Risk	Negligible Risk
BECHLER CREEK S&G	Negligible Risk	Negligible Risk
DEER CREEK S&G	Negligible Risk	Negligible Risk
POLE CREEK	Negligible Risk	Negligible Risk
SO FORK TINCUP CREEK S&G	Negligible Risk	Negligible Risk
WHITE CREEK S&G	Negligible Risk	Negligible Risk
SNAKE RIVER	Negligible Risk	Negligible Risk
POLE DRANEY S&G	Negligible Risk	Negligible Risk

Temple Peak

The Temple Peak population is located on the southeastern portion of the BTNF at the south end of the Wind River Range. The potentially nascent population is the result of reintroduction efforts that date between the 1960s and 1990s. The State Working Group status for this herd is a cooperative review population.

Based on discussions with WGFD staff, it was determined that the data currently available was not sufficient to accurately delineate the CHHR for the Temple Peak population. WGFD has committed to collecting additional data using radio marked bighorn sheep. Once collected, this data will be used to understand the status of the Temple Peak population. Delineation of the CHHR will be deferred until that time.

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Wyoming Bighorn Sheep - Core Herd Home Range